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Case Report

An Unusual Cause of Infective Endocarditis: *Proteus mirabilis* Bacteremia from an Infected Pressure Ulcer☆

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SUMMARY

Proteus species is a common cause of urinary tract and wound infections in humans. We herein present the case of a 71-year-old male who had fever, a new-onset heart murmur, bacteremia, and a vegetation over his native aortic valve in echocardiography. This rare case demonstrated that infective endocarditis could be caused by *Proteus mirabilis* from an infected pressure ulcer.

1. Introduction

Proteus species is a rare cause of native valve endocarditis in humans. The bacterial species is common in the urinary tract. Most cases of *Proteus*-induced endocarditis are reported in patients with concurrent urinary tract infection. However, unlike the previously reported cases with concurrent *Proteus*-induced urinary tract infection, we herein report a case of infective endocarditis caused by *Proteus mirabilis*, secondary to an infected pressure ulcer.

2. Case report

A 71-year-old male with a history of cervical spine injury and quadriplegia presented with intermittent fever for 2 days, having had no prior contact history or cluster history.

On examination, the patient was alert with vital signs recording a temperature of 36.9°C, pulse rate of 129/min, and blood pressure of 143/112 mmHg. Systemic examination revealed a new-onset Grade 2 systolic murmur in the aortic area. A 3 cm × 13-cm pressure sore with pus formation was noted over his lower back. A tender erythematous papule was also noted in the dorsal part of his right ring finger.

Laboratory investigation revealed the following measurements: white cell count of 7.07 × 10^3/μL, hemoglobin level of 12.1 g/dL, platelets count of 227 × 10^3/μL, serum sodium level of 134 mmol/L, and serum potassium level of 3.0 mmol/L. Results of urinalysis revealed mild hematuria and pyuria. An electrocardiogram showed sinus tachycardia, and a right pleural effusion was noted on his chest X-ray.

Transthoracic echocardiogram revealed a 13.8 mm × 4.4-mm aortic valve vegetation with mild aortic regurgitation and impaired ejection fraction of 55%. (Figure 1A) Two sets of blood samples were collected, and both grew *Proteus mirabilis*, which was sensitive to amikacin and ceftazidium but resistant to gentamicin. The wound culture grew oxacillin-resistant *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Proteus mirabilis*, which had the same sensitivity test results as identified from the blood cultures. His urine culture grew *Citrobacter*; however, no *Proteus* species was isolated. *Mycobacterium tuberculosis* was later isolated from his sputum culture.

The patient was first treated with intravenous augmentin (1.2 g) and gentamicin (80 mg) 8 hourly. His treatment regimen was then changed to ceftazidium (2 g) 8 hourly and amikacin (250 mg) 12 hourly according to the sensitivity results. Surgical treatment was discussed, however, the patient preferred to continue with medical treatment. During this period, we maintained the antibiotic treatment and two further sets of blood cultures showed negative

☆ Conflicts of interest: The authors have no conflicts of interest to declare.

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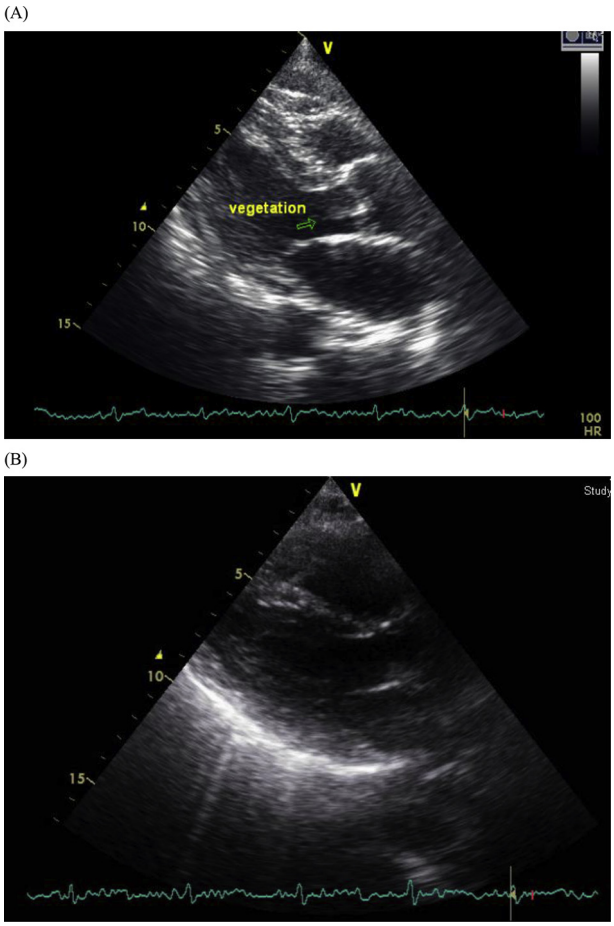

Figure 1. (A) A 13.8 mm × 4.4-mm aortic valve vegetation is noted in echocardiography. (B) There is no evidence of vegetation in the follow-up echocardiography.

findings. However, a low-grade fever developed after 2 weeks. We therefore changed the antibiotics regimen to ceftriaxone (2 g) daily and fosfomycin (4 g) 8 hourly. On the 20th day after admission, the patient suffered cardiorespiratory arrest. Cardiopulmonary resuscitation was performed and the patient was transferred to the intensive care unit. He was managed with intubation and mechanical ventilation due to acute respiratory failure. Follow-up echocardiography showed adequate left ventricular and right ventricular function with no evidence of vegetation or aortic regurgitation (Figure 1B). However, acute pancreatitis and acute kidney injury subsequently developed during the following days with associated hypotensive episodes. Because of the poor prognosis, his family refused further investigation and decided to discharge him against medical advice.

3. Discussion

Proteus species are a Gram-negative bacillus within the Enterobacteriaceae family, which can produce urease. *Proteus* species are highly motile and usually isolated from the human gastrointestinal tract, soil, and contaminated water. It can cause urinary tract infections (UTIs), especially in those who have anatomical urologic abnormalities or undergo long-term catheterization[1]. *Proteus mirabilis* is one of the most important members in this genus, and can cause UTIs or wound infections in humans. Infected pressure ulcers were reported as the second most common cause of bacteremia. In previous surveys, *Proteus mirabilis* is commonly isolated from patients with bacteremia secondary to pressure ulcers[2].

Infective endocarditis caused by *Proteus mirabilis* is extremely rare, but is associated with high morbidity and mortality. The majority of previous case reports revealed positive culture results from urine samples or evidence of urinary tract infection[3–6]. However, the others were negative[7] or remained unknown in urine culture[8]. In our case, although no *Proteus* species were isolated from the urine culture, *Proteus mirabilis* were found in both blood and wound cultures. The two species of *Proteus mirabilis* shared an identical sensitivity pattern toward antibiotics. This is the first case demonstrating that infective endocarditis can be a complication of *Proteus* bacteremia from a pressure ulcer.

The majority of the previous reports indicated that infective endocarditis due to *Proteus mirabilis* most commonly affects the mitral valve. However, our case presented as a native aortic valve vegetation on echocardiogram. The size of the vegetation can be an indication for surgical intervention. Although most of the previous *Proteus mirabilis* endocarditis cases with native valve reported large vegetation, our case presented with relatively small vegetation, which may be due to early detection. A vegetation of >10 mm in size has been reported as having a high risk of embolic events and is related to higher mortality rates[9,10]. As a result, large vegetations are an indication for surgical intervention under the current guidelines[11]. Based on the absence of vegetation in the follow-up echocardiography, the rupture of vegetation and subsequent systemic embolic events may be the cause of the sudden cardiovascular collapse. Sudden death is not uncommon in cases of infective endocarditis, and one of the common causes is embolic event[12]. The patient's clinical condition was stable before his sudden collapse, and no other new-onset neurological sign or embolic evidence was noted during his admission. Acute kidney injury and acute pancreatitis can be due to systemic embolism or hypoperfusion after cardiac arrest. However, there is no other definitive evidence to support our hypothesis due to his family's request.

Proteus mirabilis endocarditis is rare, and this is the first reported case caused by an infected pressure ulcer. *Proteus mirabilis* is also one of the common antibiotic-resistant strains among nursing-home residents[13]. Because of the prolongation of life and the increasing need for long-term care, pressure ulcers can be more prevalent in long-term care facility. For febrile patients with infected pressure ulcers and *Proteus* bacteremia, the differential diagnosis of infective endocarditis should be considered.

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